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ABSTRACT

This paper describes a simulation activity, which was coupled with Confluent/Gestalt meta-processing, that was designed to address the affective component of a mathematics procedures class for preservice teachers. The activity consisted of an explanation and demonstration for teacher educators. It is argued that a reconstruction of disposition towards mathematics is an essential component of effective professional education programs. In order for student teachers to acquire a positive disposition towards mathematical thinking, instructors must help these students to deconstruct their prior learning, which may have negatively impacted their attitudes toward mathematics, and to reconstruct a new understanding of mathematical processes. In the simulation which is presented, participants experience an intervention, characterized by Confluent/Gestalt meta-processing, that can be used with student teachers in a mathematics methods class. The intervention is designed to access the powerful affective inhibitors to performance. Confluent education is an instructional model, in which the learner plays an active role, based on the premise that all learning is accomplished by an affective as well as a cognitive component. Meta-processing is a form of reflective thinking that occurs in the intervention, as participants examine their affective responses. (IAH)

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Simulation and Meta Processing: Affective Component of Math Procedures

Experiential Session

presented by

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Simulation and Meta Processing: Affective Component of Math Procedures

Abstract: This paper responds to the question put forth by the American Association of Colleges of Teacher Education: How can colleges and universities design and offer the most effective campus-based programs to prepare school personnel to ensure the success of today's children and youth? Designed as an experiential session, the author presents a simulation activity coupled with Confluent/Gestalt meta-processing to address the affective component of the mathematics procedures class. It is argued that a reconstruction of disposition towards mathematics is an essential component of professional education programs if we are to serve today's children and youth and meet tomorrow's needs.

The importance of mathematical literacy is evident in the emergence of a national agenda put forth by the National Governor's Association (1988) and the President in *America 2000: An educational strategy* (1991). A sense of national urgency is fueled by the realization that competition in the global marketplace requires better prepared students in both mathematics and science (Business Roundtable, 1989, 90, 91).

"Most students (and most adults) can't interpret graphs, don't understand statistical notions, are unable to model situations mathematically, seldom estimate or compare magnitudes, are immune to mathematical beauty, and, most distressing of all in a democracy, hardly ever develop critical, skeptical attitude toward numerical, spatial, and quantitative data or conclusions." (Paulos, 1991)

California State Board of Education's new curriculum framework in Math, drawing on the work of the National Council of Teachers of Mathematics (NCTM, 1990), and the National Research Council, (1990), proposes substantial changes in the content emphasis of mathematics instruction as well as changes in pedagogy (CSBE, 1992). It is evident that pre-service teacher preparation programs must become key players in promoting instructional change.

We can assume that the population of student teachers resembles the greater population with limited mathematical literacy. Many multiple subject credential students confront their own lack of confidence and actual math phobia for the first time in their math procedures classes.

Personal disposition towards mathematics is assumed to be a significant variable affecting competence. Therefore, if teacher education programs are to influence a change in how math is learned, it is necessary to design successful interventions to increase competence and positive disposition in mathematical thinking during the preparation of these new teachers. Given that student teachers are expected to encourage mathematical literacy in future generations, an affective component is essential in mathematics preparations classes.

Research on teacher thinking, particularly as it involves attitudes and dispositions is relevant to this study. Following Bandura's early work to define self-efficacy (1977a), some researchers have looked at the effect of self-efficacy as it relates to teaching (Gibson and Dembo, 1985; Chiarelott and Czerniak, 1990), These studies define self-efficacy as a belief that one's abilities are effective. Although Chiarelott and Czerniak's work focused primarily on teachers' self-efficacy in relation to science, their work generally confirms Bandura's finding that poor self-efficacy, often manifested in a state of anxiety, can debilitate performance.

Other studies have focused on the effects of prior experience on affective disposition towards math. Repeated negative experiences with mathematics have resulted in feelings of inadequacy, anxiety and a negative disposition towards the perceived cause of their anxiety (Tobias, 1985; Gaudry and Spielberger, 1971; Sieber, et. al, 1977).

These studies have found relationships among perceived ability (self efficacy), anxiety and disposition. However, the identification of appropriate strategies to reduce anxiety, raise self efficacy and improve disposition requires further study (Czerniak and Chiarelott, 1990). Interventions that involve affective processing may have potential to support the reduction of anxiety, thereby freeing energy to be focused on the problem. (Brown, 1990; Kogelman and Warren, 1978).

In a key position to influence the desired changes, the instructors of mathematics methods courses are challenged to ensure that student teachers acquire a "positive disposition" towards mathematical thinking at the same time as they acquire the necessary cognitive processes that constitute content knowledge. Because prior experiences have impacted some student teachers so negatively, instructors must help their students deconstruct their prior learning and reconstruct a new understanding of

mathematical processes. This experiential session is designed to offer participants the opportunity to experience a Confluent/Gestalt intervention to use with student teachers in the math procedures class. The purpose of the intervention is to access the powerful affective inhibitors to present performance. Once brought to awareness, these past experiences may be defused as anxiety producers, allowing students to take control of and refocus their energy toward a more constructive approach to mathematics.

It is useful to examine the problem of reconstructing student teachers' disposition towards mathematics from the perspective of Confluent education, an instructional model based on the premise that all learning is accompanied by an affective as well as a cognitive component (Brown, 1990; Shiflet & Brown, 1972). Confluent education makes explicit the role of affect in learning, and in so doing, provides a model for use with student teachers. Another important Confluent principle is the active position of the learner. Confluent interventions encourage the involvement of the learner in present time experiences.

"Meta processing," an adaptation of a contact/withdrawal technique borrowed from Gestalt therapy (Brown, 1990) is an integral component of Confluent Education. It can be used regularly during the math procedures course to encourage student teachers to examine their attitudes and understandings of mathematics through systematic reflection on the process as well as the content of the learning situation (Brown, 1990; Shiflet & Brown, 1972). While the inclusion of "processing" in lesson design is used in both science and mathematics methods classes, "meta processing" is distinguished from processing in both purpose and design.

Processing is generally used to share understandings, strategies and feelings. It is also used to make explicit the diverse meanings attributed to a given situation by different participants. At the simple processing level, a written response to the simulation is shared with other participants. In contrast, meta processing is a form of reflective thinking that disengages the participants from active involvement with a particular task in order to reflect on the physical manifestation of personal affective response. The learner withdraws from contact with the task to contact a different level of experience. By taking a second level of observation, to observe the self observing, meta processing is designed to reveal personal meanings

brought to a given content or feeling. Meta processing in this intervention occurs when participants examine their affective response to what they have written. Frequently, it is at the meta processing level that specific, deep, unconscious memories reemerge in the consciousness of participants. Once they have emerged, often intact with the emotion of the past experience, the participant is able to consciously choose to decouple the baggage of emotion from the content material. When given the opportunity to "meta process" in the content area of mathematics, many adults bring to consciousness the moment they began to believe they were incapable of learning. It is usually a powerful event which from that time forward influenced their sense of competence and efficacy.

Simulation[1].

The intervention begins with a guided imagery experience. The facilitator says," Please close your eyes, relax. (Pause) Let your imagination take you back in time to when you were young, sitting at a desk at school. (Pause) It is math time. When you have an image in your mind, let yourself come back to the present as that youngster. (Pause. Wait for participants to open their eyes.) When all participants are ready, the facilitator continues, "Today we are going to learn to use symbols to represent quantites." (On an overhead projector or chart paper, the faciliator draws one dot and writes the symbol for one.) "This is one. This is how we write one. This is two. This is how we write two." (See Appendix A) Facilitator continues in this pattern until all nine symbols have been introduced. The symbol for zero is also introduced. Participants are given a set of flash cards to help them gain familiarity with the new symbols. (Allow approximately 5-8 minutes.)

After a quick "review" of the symbols which represent the ordinal numbers on a number line, participants are asked to take the role of student in a traditional testing situation. "Please take out something to write with, we are now going to take a test." (Pass out booklets.) "Use your left hand if you are right handed and your right hand if you are left handed. (Authoritatively) Since this is a test to see how well you learned the symbols, you need to do your own work. I don't want to see your eyes on anyone else's paper. Are there any questions? (No pause) Turn to page

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1. The simulation activity incorporates an adapted form of the Ctaite Mathe Teakst Buk, developed by the Center for Innovation in Education.

one. Ready? Begin. During this portion of the simulation the facilitator must circulate, praising some students, intimidating others. Many adults who would normally behave in appropriate ways allow themselves to react to the facilitator's interventions by being outrageous. Some adults try to copy from a neighbor, some throw notes, some whisper the answers. The facilitator must respond as a strict disciplinarian, taking student's papers or ostracising students if necessary. While respect for cultural patterns of behavior needs to be accomodated, the degree to which the simulation seems real to participants is important. Approximately ten seconds before the end of the test taking, the facilitator says, "Finish up the last problem. O.K., pens down."

Following the activity, participants are asked to get in touch with their feelings and to write about what emerged for them as a result of the experience. (Allow appropriate time for responding.) Process questions might include:

1. What did you learn?
2. How did this activity make you feel?
3. What strategies did you use to get the work done?
4. What did the teacher do to help? hinder?
5. Were you concerned about getting it done or getting it right?
6. Can you make any comparisons between how you feel and how some of your second language learners feel?
7. Did you feel a sense of pride for doing it fast?

Following the quick write participants share what they have written with their neighbor. Each person in the dyad pair needs to have an opportunity to speak without being interrupted. When each has had the opportunity, the facilitator opens the whole group discussion.

The simulation is expected to raise questions and comments ranging from the power of affect in supporting or blocking learning, to appropriate assessment strategies that support student performance. Often personal stories are told with such intensity it becomes apparent that the participant might benefit from "meta processing" her material. In this case, when a particular memory has emerged, the facilitator might ask the person who is sharing, "If you had an opportunity to tell that teacher something right now, what would you say to her? Pretend I am that

teacher." It is this experience that allows the participant to reconstruct the affect of the memory by reframing it in the context of the simulation.

Following are some examples of "meta processing" sessions:

P: "This reminds me of Mrs. Floodman in eighth grade when the class was clearly not ready for the test but even though we protested she gave it anyway. We were confused and tried to communicate between us but she kept yelling for quiet. Gretchen and I were trying to help each other when she caught us and intimidated us up in front of the whole class saying we cheated. We had to go to the Principal."

F: If you had the chance, what would you like to tell Mrs. Floodman?

P: You made us take a test when you knew we didn't know the material. That was a waste of our time and it only made us feel stupid. When we tried to succeed the only way we could we got in trouble. You made us fail.

Another participant says:

P: What it brought up for me was my fear of getting in trouble of doing it wrong and wanting the teacher to like me and also not really caring because I knew he was being unreasonable.

F: If I were the teacher what would you say to me?

P: I feel withdrawn, invisible, quiet and rebellious. Very aware of myself and past decisions. I am also feeling appreciative of my ability to adapt and not listen to what you have to say, knowing that *I am not dumb*. What I appreciate is my recognition that I am not dumb. I learned to adapt, and count on my fingers, hiding it in my hair.

This preliminary work suggests that simulations to stimulate the reconstruction of prior experience, when coupled with meta processing, are useful to deconstruct negative dispositions toward mathematics. It is not surprising that the anxiety associated with mathematics is often the result of prior miseducative experiences. From the responses of participants, it can be shown that in many cases negative disposition towards math is a defensive response against poor classroom

management, outright neglect or abuse of students rather than actual inability with mathematical concepts. Unlike the student who hid her fingers in her hair, many students simply give up trying to understand math when they decide they are dumb. Once the student teacher becomes aware of the true attribution of negative feelings towards mathematics, the reconstructive process can begin.

Until we have a generation of students who have been taught to construct mathematical understanding as the NCTM standards and CA Frameworks suggest, negative disposition towards math will continue to exist and must be addressed in teacher education programs. As meaning is constructed partially of the affect associated with experience, student teachers need to participate in learning activities designed to uncover prior personal learning experiences. Through simulation, students' awareness of the origins of their own disposition towards mathematics is revealed in the context of present experience. Once prior learning is brought to a conscious level, students in the mathematics procedures classes appear to be better able to disassociate the baggage of negative affect from their present mathematical potential. They become more sensitive to the potential harm of miseducative instruction. *The Ctaite Mathe Teaxt Buk* simulation, coupled with meta processing, has been used to support a reconstruction of disposition towards mathematics. It is concluded that such simulation activities are powerful interventions when they are included as a component in the professional development of new teachers.

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